# Dividing Decimals

**Objective:** To be able to divide whole numbers and decimals into decimals, with decimal quotients

**Standard:** 3rd grade NS 3.3, divide a money amount by a whole number
5th grade NS 2.1, divide decimals

**Prerequisites:** Whole number division, multiplication by tenths, hundredths, thousandths

**Best Practices:** Warm-ups, Syntax, Choral Response, Concrete Models, You Trys, Side-by-side

## *Part 1: Dividing a money amount by a whole number*

### Method #1: Guess and Check

| | |
|---|---|
| $3\overline{)3.75}$ | |
| $-3.00$ | $1.00$ |
| $0.75$ | |
| $-0.30$ | $0.10$ |
| $0.45$ | |
| $-0.30$ | $0.10$ |
| $0.15$ | |
| $-0.15$ | $0.05$ |
| $0$ | $1.25$ |

When we look at our dividend, can our divisor go in 1 time?
[yes]

Let's try it. When we write our divisor, write it as a decimal to the hundredths place since our dividend goes to the hundredths place. What is the subtraction problem?
[$3.75 - 3.00 = 0.75$]

Since this number is smaller than 1, we have to multiply by numbers smaller than 1. If I multiply 3 by 0.10, what will I get?
[0.30]

Is this smaller than 0.75?
[yes]

> Note: Use Money as a concrete example to explain how we guess these numbers.

Subtract again and keep trying numbers less than 1 with your partner until you get to 0.

(Debrief the answer and make any necessary mitigations)

## Method #2: Stacking

$$
\begin{array}{r}
0.05 \\
0.20 \\
1.00 \\
\end{array}\Big\} \; 1.25
$$

$$
3\overline{)3.75} \\
-3.00 \\
\overline{\phantom{0}0.75} \\
-0.60 \\
\overline{\phantom{0}0.15} \\
-0.15 \\
\overline{\phantom{00}0}
$$

This method looks very similar to the traditional method. We are showing all of our steps separately and in decimal notation.
Let's start with our dividend, what number is in the 1's place?
[3]

How many times can 3 go into 3?
[1]

Multiply 3 by 1.00 and then subtract. Then look at the tenths place. 3 will have to be multiplied by a number smaller than 1. How many times does 3 go in 7?
[2]

So we will multiply 3 by 2tenths. What is 3 times 2tenths?
[6tenths or 60 hundredths]

Subtract that from 75hundredths, and you will get 15hudredths. Now finish up the rest of the problem.

(Debrief the answer and make any necessary mitigations)

### You Try #1

**Guess Method**

$$
2\overline{)6.50} \\
\begin{array}{rl}
-2.00 & 1.00 \\
\overline{\phantom{0}4.50} \\
-2.00 & 1.00 \\
\overline{\phantom{0}2.50} \\
-2.00 & 1.00 \\
\overline{\phantom{0}0.50} \\
-0.20 & 0.10 \\
\overline{\phantom{0}0.30} \\
-0.20 & 0.10 \\
\overline{\phantom{0}0.10} \\
-0.10 & 0.05 \\
\overline{\phantom{00}0} & 3.25 \\
\end{array}
$$

> The quotient is written to the side of the equation and work. We would also write that in decimal notation to help us when we need to add our partial quotients.

**Side Work**

2 × 1.00 = 2.00
2 × 0.10 = 0.20
2 × 0.01 = 0.02

**Stacking Method**

$$
\begin{array}{r}
0.05 \\
0.20 \\
3.00 \\
\end{array}\Big\} \; 3.25
$$

$$
2\overline{)\;6.50} \\
-6.00 \\
\overline{\phantom{0}0.50} \\
-0.40 \\
\overline{\phantom{0}0.10} \\
-0.10 \\
\overline{\phantom{00}0}
$$

> Use what you know! 2 times 3 is 6, then convert it to decimal notation. Keep your decimals lined up so that you don't make mistakes.

***Part 2: Decimal divided by a decimal to the tenths place***

| **Guess Method without decimals** | **Guess method with decimals** | **Stacking method** |
|---|---|---|

**Guess Method without decimals**

```
37) 35,705
  − 3,700  | 100
  ─────────
   32,005
  − 7,400  | 200
  ─────────
   24,605
  −11,100  | 300
  ─────────
   13,505
  −11,100  | 300
  ─────────
    2,405
  − 1,110  | 30
  ─────────
    1,295
  − 1,110  | 30
  ─────────
      185
  −   111  | 3
  ─────────
       74
  −    74  | 2
  ─────────
        0  | 965
```

**Guess method with decimals**

```
37) 357.05
  − 37.00  | 1.00
  ─────────
   320.05
  − 74.00  | 2.00
  ─────────
   246.05
  −111.00  | 3.00
  ─────────
   135.05
  −111.00  | 3.00
  ─────────
    24.05
  − 11.10  | 0.30
  ─────────
    12.95
  − 11.10  | 0.30
  ─────────
     1.85
  −  1.11  | 0.03
  ─────────
     0.74
  −  0.74  | 0.02
  ─────────
     0.00  | 9.65
```

**Stacking method**

```
        0.02  ⎫
        0.03  ⎪
        0.30  ⎪
        0.30  ⎬  9.65
        3.00  ⎪
        3.00  ⎪
        2.00  ⎭
        1.00
37) 357.05
   −37.00
   320.05
   −74.00
   246.05
  −111.00
   135.05
  −111.00
    24.05
   −11.10
    12.95
   −11.10
     1.85
    −1.11
     0.74
    −0.74
     0.00
```

Another use for this method is to reinforce place value.

**Guess method without decimals**

$$
\begin{array}{r|r}
3\overline{)\ 2835} & \\
-\ \ 300 & 100 \\
\hline
2535 & \\
-1500 & 500 \\
\hline
1035 & \\
-\ \ 600 & 200 \\
\hline
435 & \\
-\ \ 300 & 100 \\
\hline
135 & \\
-\ \ 120 & 40 \\
\hline
15 & \\
-\ \ \ 15 & 5 \\
\hline
0 & 945 \\
\end{array}
$$

**Guess Method with decimals**

$$
\begin{array}{r|r}
3\overline{)\ 28.35} & \\
-\ \ 3.00 & 1.00 \\
\hline
25.35 & \\
-15.00 & 5.00 \\
\hline
10.35 & \\
-\ \ 6.00 & 2.00 \\
\hline
4.35 & \\
-\ \ 3.00 & 1.00 \\
\hline
1.35 & \\
-\ \ 1.20 & 0.40 \\
\hline
0.15 & \\
-0.15 & 0.05 \\
\hline
0 & 9.45 \\
\end{array}
$$

Keep your decimals lined up in your partial quotients so they are easy to add. Do side work as needed.

**Stacking Method**

$$
\left.\begin{array}{r}
0.05 \\
0.40 \\
3.00 \\
5.00 \\
1.00 \\
\end{array}\right\} 9.45
$$

$$
\begin{array}{r}
3\overline{)\ 28.35} \\
\underline{-3.00} \\
25.35 \\
\underline{-15.00} \\
10.35 \\
\underline{-9.00} \\
1.35 \\
\underline{-1.20} \\
0.15 \\
\underline{-0.15} \\
0.00 \\
\end{array}
$$

***Part 3:*** ***Dividing a decimal by a decimal to the hundredths and thousandths***

**Guess Method**                                                    **Stacking Method**

$$2.4{\overline{\smash{\big)}\,15.12}}$$

|  |  |
|---|---|
| − 4.80 | 2.00 |
| 10.32 |  |
| − 4.80 | 2.00 |
| 5.52 |  |
| − 4.80 | 2.00 |
| 0.72 |  |
| − 0.72 | 0.30 |
| 0.00 | 6.30 |

SideWork
2.4 × 1 = 2.4
2.4 × 10 = 24
2.4 × 2 = 4.8
2.4 × 3 = 7.2

Note: For both of these methods it is a good idea to teach kids to do side work to help them. They can make a multiplication chart with 10's, 5's, 2's and 1's.

$$
\begin{array}{r}
0.30 \\
2.00 \\
2.00 \\
2.00 \\
\end{array} \left.\right\} 6.30
$$

$$2.4{\overline{\smash{\big)}\,15.12}}$$
−4.80
10.32
−4.80
5.52
−4.80
0.72
−0.72
0.00

**You Try #3**

**Guess Method**                                                    **Stacking Method**

$$4.2{\overline{\smash{\big)}\,14.742}}$$

|  |  |
|---|---|
| −4.200 | 1.00 |
| 10.542 |  |
| −8.400 | 2.00 |
| 2.142 |  |
| −0.420 | 0.10 |
| 1.722 |  |
| −0.840 | 0.20 |
| 0.882 |  |
| −0.840 | 0.20 |
| 0.042 |  |
| −0.042 | 0.01 |
| 0 | 3.51 |

$$
\begin{array}{r}
0.001 \\
0.100 \\
0.200 \\
0.200 \\
3.000 \\
\end{array} \left.\right\} 3.51
$$

$$4.2{\overline{\smash{\big)}\,14.742}}$$
−12.600
2.142
−0.840
1.302
−0.840
0.462
−0.420
0.042
−0.042
0

# Warm-Up

| CST: 4NS 3.4 | CST: 5NS 2.2 |
|---|---|

42

$$3\overline{)2835}$$

A 845
B 854
C 945
D 954

*Solve this problem 2 ways.

31    What is the answer to this division problem?

$$12\overline{)246}$$

A 2.05
B 2.5
C 20.5
D 25

*Describe common errors for two answer choices. What is a good mitigation for fixing these errors?

| CST: 5NS 2.2 | CST: 5NS 2.2 |
|---|---|

29

$$35,705 \div 37 =$$

A 89
B 843
C 925
D 965

*Which answer could you immediately eliminate? How could you teach others to eliminate incorrect answers?

31

$$15.12 \div 2.4 =$$

A 0.513
B 0.63
C 5.13
D 6.3

* How are answers A and C similar?

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